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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/508,996	09/27/2004	Alessandro Tredicucci	Q83897	1328

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EXAMINER

VAN ROY, TOD THOMAS

ART UNIT PAPER NUMBER

2828

DATE MAILED: 09/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/508,996	Applicant(s) TREDICUCCI ET AL.	
	Examiner Tod T. Van Roy	Art Unit 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>09/27/2004</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

The disclosure is objected to because of the following informalities:

The disclosure makes reference to various claims and their claim numbers (see pg.1 para.1). Throughout the course of prosecution these claim numbers may be changed or all together cancelled, thus it is improper to reference these numbers in the specification.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 3-4 are rejected as the applicant has not made clear the claimed subject matter. It is not clear whether the reference made to (ϵ_2) is meant to mean that both regions surrounding the waveguide layer have the same dielectric constant (i.e. same material), or if (ϵ_2) is meant as a general dielectric constant that could be different for each region (leading to possibly differing surrounding materials). The applicant has

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further used the word "module", when it is believed that the correct term would be "modulus". Assuming that "modulus" is the correct term, it is once again unclear via the claim language whether the modulus of the (ϵ_2) value (or values) is to be compared with the order of simply the dielectric constant (ϵ_1) as claimed, or should be compared with the modulus of the dielectric constant (ϵ_1). These issues are not distinctly claimed as currently written, and are also not found to be made clear via the contents of the specification.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 5, 7-10, and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Colombelli et al. ("Far infrared Surface Plasmon Quantum Cascade Lasers at 21.5um and 24um Wavelengths"; APL vol.28, no.18, pgs.2620-2622, April 30 2001, applicant submitted prior art).

With respect to claim 1, Colombelli discloses a semiconductor laser comprising: an active region which, in response to a pumping energy (electrical, fig.3) applied thereto, can produce a stimulated emission of radiation with a central wavelength in the far infrared region (pg.2620 col.2 para.1), and at least one confinement region (top metal plasmon layer, pg.2621 col.1 para.1, bottom doped layer, pg.2622 col.2 para.1)

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suitable for confining the radiation in the active region and comprising at least one interface between adjacent layers that is capable of supporting plasmon modes generated by an interaction of the interface with the radiation (both layer interfaces capable), characterized in that the at least one confinement region comprises a waveguide layer (n++, pg.2622 col.2 para.1, which replaces n InGaAs layer and location) which is delimited on opposite sides by a first interface (with InP substrate) and by a second interface (with active region), the guide layer being doped in a manner such that the first and second interfaces are capable of supporting the plasmon modes (due to doping, which would make the dielectric constant negative, compared with the positive constants on either side), respectively, and the guide layer being of a thickness such as to bring about the accumulation of the plasmon modes in proximity to the first and second interfaces, outside the layer, and substantially a suppression of the plasmon modes, inside the layer (thickness of 750nm, pg.2622 col.2 para.1, which would accumulate the modes near the interfaces, but only minimally inside the layer, see $\Gamma = 0.98$ for strong active region confinement).

With respect to claim 2, Colombelli discloses the plasmon modes of the first and second interfaces are mutually coupled (due to thickness, and partial penetration of the mode into the layer, pg.2622 col.2 para.1).

With respect to claim 5, Colombelli discloses the active region comprises a quantum cascade active region (pg.2620 col.2 para.1).

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With respect to claim 7, Colombelli discloses the guide layer (recall - is to replace the n InGaAs layer) is interposed between the active region and the substrate region (pg.2621 col.1 para.1).

With respect to claim 8, Colombelli discloses the guide layer is in contact with the active region (pg.2621 col.1 para.1).

With respect to claim 9, Colombelli discloses a first electrical contact region disposed directly on the guide layer (InP substrate, pg.2620 col.2 para.2).

With respect to claim 10, Colombelli discloses a second contact region disposed directly on the active region (n InGaAs / n++ InGaAs, pg.2621 col.1 para.1).

With respect to claim 12, Colombelli discloses the thickness of the waveguide to be on the order of 100nm (750nm of same order as 100nm, pg.2622 col.2 para.1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colombelli et al.

With respect to claim 11, Colombelli teaches the laser outlined in the rejection to claim 1, and further teaches the use of the device for long wavelength ($>50\mu\text{m}$) emitters (pg.2622 col.2 para.1). Colombelli does not produce a device that emits at between 30-300 μm . It would have been obvious to one of ordinary skill in the art at the time of the invention to use an emitter having $>50\mu\text{m}$ output as Colombelli has taught that the waveguide losses would be reduced for this range (pg.2622 col.2 para.1).

With respect to claim 13 Colombelli teaches the laser outlined in the rejection to claim 1, and further teaches the guide layer to be formed of an n type semiconductor with an n^{++} "metal-like" doping value (pg.2622 col.2 para.1). Colombelli does not specify the doping value to be on the order of 10^{18} . It would have been obvious to one of ordinary skill in the art at the time of the invention to use a doping on the order of 10^{18} as it has been found to be uninventive to determine the optimum or workable range (see MPEP 2144.05 II A – ("The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages."); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969)).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Colombelli in view of Sirtori et al. ("Quantum cascade laser with plasmon enhanced

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waveguide operating at 8.4um wavelength"; APL, vol.66, no.24, pgs.3242-3244, 12 June 1995).

With respect to claim 6, Colombelli teaches the laser outlined in the rejection to claim 1, and further teaches the active region to have a non-uniform period (chirp, pg.2620 col.2 para.2). Colombelli does not teach the use of a GaAs/AlGaAs superlattice. Sirtori teaches a plasmon guiding device wherein the use of GaAs/AlGaAs is described (pg.3242 col.1 para.1). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the active region material of Colombelli with the taught material of Sirtori in order to adjust the output frequency characteristics as desired.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TVR



ARMANDO RODRIGUEZ
PRIMARY EXAMINER